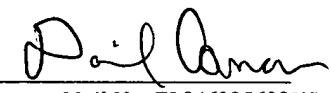


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PORATABLE BATTERY CHARGING AND AUDIO UNIT

1 **PORABLE BATTERY CHARGING AND AUDIO UNIT**

2 **Field of the Invention**

3 This invention generally relates to portable audio and battery pack charging
4 equipment.

5 **Background of the Invention**

6 Cordless power tools are frequently found and used in locations that do not
7 have readily available or convenient sources of power. These locations include
8 construction sites and partially completed buildings. At locations such as these, the
9 battery operated tools provide an obvious advantage, but the battery packs eventually
10 become depleted and need to be recharged. While some users bring a sufficient number
11 of battery packs to last for a complete day, at some stage of the construction, there is
12 generally at least temporary electrical service provided which may enable battery packs
13 to be recharged on the construction site. The location of the temporary electrical service
14 may be some distance from the actual work location and since the charger may be located
15 some distance from the user, issues can arise that may prevent the successful completion
16 of a charging operation. For example, another worker may take a battery pack for his
17 own use, or the charger may simply be unplugged so that some other operation may be
18 performed, since the number of available receptacles may be limited.

Workers also like to take audio equipment such as portable radios to construction sites so that they can listen to music and other programs while they are working. It is well known that construction sites present a tough environment for such audio equipment which is prone to being damaged over time for obvious reasons.

Summary Of The Invention

A preferred embodiment of an audio power unit is disclosed which provides an audio output and charges removable battery packs as well as providing a number of AC receptacles for powering other tools and the like when the unit is connected to a source of AC power. The unit can optionally also provide DC power. When the unit is connected to a source of AC power, the AC power drives the audio unit which may be a radio or a combination radio and CD player and the AC source also powers a charger which recharges a battery pack if a battery pack is inserted into the charger receptacle. If the unit is not connected to a source of AC power, the radio may be powered by a battery pack when it is placed in the charger receptacle. When the unit is connected to a source of AC power, a relay is opened to isolate the radio unit from the charger and battery pack.

17 The unit has a unique protective frame structure that is connected to the
18 housing of the unit. The preferred embodiment of the present invention also has a circuit
19 that includes a relay that is adapted to isolate the battery pack and charger from the audio

1 FIG. 9 is a simplified electrical schematic diagram of the preferred
2 embodiment of the present invention.

3 Detailed Description of the Preferred Embodiment

4 A preferred embodiment of a portable battery charging an audio unit is
5 shown in the drawings and which includes a housing, indicated generally at 10, which is
6 in the form of a cube, although it could be a cuboid if desired, as well as some other
7 shaped volume. As illustrated, it includes a front face or wall 12, a left side face or wall
8 14, a top surface 16, a rear wall 20 (see FIG. 4) and a right side face or wall 22. The
9 housing 10 is preferably made of a tough plastic or other molded material, and may be
10 comprised of a few or several parts that structurally fit together in a rugged strong unit.
11 For example, the front and back walls 12 and 20 may be generally flat unitary pieces
12 which are connected together to one or more molded or otherwise formed front, top,
13 bottom and rear walls that may be formed as one, two, or more components that are
14 connected together with hex- head bolts or screws 24. While the housing 10 is in the
15 shape of a cube, i.e., the size of each wall is generally the same, the housing may also be
16 a cuboid where one or more of the length, height and width dimensions may be greater
17 than the others, i.e., a rectangular box-like shape, or a more unusual volume may be
18 defined by the walls of the housing.

19 The preferred embodiment has an audio unit, indicated generally at 30,
20 which is located in the front face 12 of the unit. As best shown in FIGS. 1 and 2, the

1 audio unit comprises a radio that has a control panel 32 with a volume control 34, a
2 tuning control 36, a display 38 for displaying the station identification as well as the
3 current time. There are time adjust buttons 40, 42 and 44 with the button 42 controlling
4 the hours, setting and the button 44 controlling the minutes setting. A CD player is also
5 provided as part of the unit 30 and a CD tray 46 is positioned above the control panel 32.
6 There is an eject button 48, a pause or standby button 50, as well as forward and
7 backward adjustment buttons 52 and 54, respectively, located on the control panel 32.
8 Speakers 56, 58, 60 and 62 are also provided and are located below the control panel 32.

9 The unit can be connected or plugged into a source of AC power using a
10 cord 70 having a 3-prong plug 72 as best shown in FIG. 6. The unit has a cord wrap
11 structure comprising four outwardly extending flanges 74 that are arranged in a square
12 around which the cord can be wrapped for storage. The flanges each have a base portion
13 76 for mounting to the sidewall 14 and are connected thereto by screws 78 or the like. It
14 should also be understood that the flanges 74 may be integrally formed in the sidewall 14
15 if desired. A fuse 80 for the circuitry to be described is accessible on the left side wall 14
16 as is a DC receptacle 82 which is protected from the elements by a removable flexible
17 plug that is preferably made of rubber or like material which can be inserted into the
18 receptacle opening.

19 The unit has a charger internally located in the housing which is accessible
20 through a charger door 86 as shown in FIG. 4. A handle 88 is provided at its upper end
21 which engages a complimentary surface to hold the door shut, but which can be readily

1 opened by a user without difficulty. A hinge 90 on the lower end of the door enables the
2 door to be opened to reveal a holding chamber 92 that has a receptacle 94 at the bottom
3 of the chamber 92 as shown in FIG. 5. The configuration of the receptacle 94 is
4 complimentary to receive a battery pack such as those marketed by the Robert Bosch
5 Tool Corporation. A number of spring clips 96 are also provided to retain the battery
6 pack in place while it is charging, which requires the cord 78 to be connected to a source
7 of AC power.

8 On the right sidewall 16 and referring to FIG. 7, a pair of duplex AC outlets
9 100 is located beneath doors 102 (only one of which is shown) that are hinged at the top
10 of the outlet pair. While they may be standard duplex receptacles, it is preferred that they
11 be ground fault circuit interrupters to provide an extra measure of safety for the users,
12 particularly given the fact that the unit may be subjected to harsh weather conditions. As
13 is standard for ground fault circuit interrupters, a reset button 104 and test button 106 are
14 provided.

15 To conveniently carry the unit and referring to FIG. 8, the top face of the
16 unit 18 has a handle 108 that is formed by a generally hemispherical recess 110 that has a
17 bridging portion 112 that extends across the recess and which together define the handle
18 108 that can be used to carry the unit. It should be apparent that the size of the recess be
19 large enough so that the user can insert his hand easily into the recess to grab the bridging
20 portion 112.

As is apparent from the drawings, the unit has a frame structure, indicated generally at 120, which is shown in virtually all of the drawings, but is best shown in FIGS. 2, 4 and 8. The frame structure 120 is larger than the housing 10 in every direction and thereby provides a protective structure for the housing itself, as well as the components that are present on each of the front, rear and side faces of the housing. The form of the frame structure 20 is that of an open faced cube in the preferred embodiment, but could also be an open faced cuboid if desired. The frame structure has a number of elongated cylindrical rods 122 that are preferably made of hollow aluminum. The rods extend in spaced relation to the interface of each two walls as is apparent from the drawings. At the intersection of three walls which occurs at each of the eight corners of the frame structure 120, three cylindrical rods 122 are terminated in a three way connector 124 that is preferably made of strong, hard plastic or plastic-like material that is capable of withstanding abusive treatment without incurring damage. As best shown in FIGS. 2 and 4, each of the connectors has a pair of set screws 126 that fit within openings in the connector 124 and which engage the side of a cylindrical rod 122 in either the horizontal or vertical direction as shown in these drawings and which has a hex head screw 128 that is positioned to engage the rod 122 oriented in the direction transverse to the horizontal and vertical direction as shown in FIGS. 2 and 4. The set screw 128 may engage the inside diameter of the hollow rod 122 or it may engage a plug or other member that is inserted into each end of such transverse to the cylindrical rods 122, such that a secure attachment of the connector to the rod is achieved. With regard to the

1 screws 126, they may merely tighten against the outer surface of the rods in which they
2 contact, or they may be screwed into the side of the rods.

3 As best shown in FIGS. 1 and 8, the housing has an elongated recess 130
4 located at the corner of the top and sides of the housing as well as the bottom and sides of
5 the housing. A shorter cylindrical rod preferably having the same construction and
6 outside diameter 132 fits within each recess and is secured at opposite ends by fitting into
7 correspondingly sized openings in the housing. The frame structure 120 is connected to
8 these rods 132 by connecting links 134 which have openings in opposite ends through
9 which rods 122 and 132 may pass. There is a link 134 at the end of each recess 130,
10 meaning that a total of eight of them are utilized to secure the frame structure 120 to the
11 housing 12. The links 134 are preferably made of the same material as the connectors
12 124 so that they will not be easily damaged by the typically rough treatment that the unit
13 may receive on a construction site.

14 With regard to the electrical schematic of the unit embodying the present
15 invention and referring to FIG. 9, the audio unit 30 is shown being connected to the cord
16 70 via fuse 80 and lines 140 and 142. A ground 144 also extends from the outlets 100 to
17 the plug 72. Lines 140 and 142 also extend to the outlets 100 as well as to the charger 84,
18 with the charger 84 having output lines 146 and 148 that extend to the receptacle 94 into
19 which a removable battery can be inserted. Lines 146 and 148 also extend to a relay 150
20 that is controlled by a relay coil 152 which senses whether current is flowing in the lines
21 140 and 142. The relay 150 is a normally closed relay which is opened when the plug 72

1 is connected to a source of AC power which means that the audio unit is being driven by
2 the AC power source. It should be understood that the audio unit may actually run on DC
3 voltage and that the audio unit may have an internal voltage converter as part of its
4 construction.

5 Another converter 154 may be provided to power the DC outlet 82. When
6 the plug 72 is connected to an AC power source, the charger 84 is operational to charge
7 the removable battery if it is placed in the receptacle 94 and the outlets 100 are available
8 to supply power to other tools, lights or the like, as is the DC outlet 82. If the plug 72 is
9 removed from AC power, the relay 150 will be close circuited so that the removable
10 battery will be connected to the audio unit and can power the audio unit. It should be
11 understood that the charger is incapable of powering the audio unit when the relay is
12 open circuited as shown in the drawing and is incapable of powering the audio unit 30
13 when AC power is not applied to the circuit inasmuch as the charger 84 does not have a
14 resident battery or other power source other than AC power through the lines 140 and
15 142.

16 While various embodiments of the present invention have been shown and
17 described, it should be understood that other modifications, substitutions and alternatives
18 are apparent to one of ordinary skill in the art. Such modifications, substitutions and
19 alternatives can be made without departing from the spirit and scope of the invention,
20 which should be determined from the appended claims.

21 Various features of the invention are set forth in the following claims.